(This is a part of the book The Concept of Reality.pdf)

Cosmology

The metric-dynamic view of the universe leads to a cosmology that differs significantly from the standard cosmology. It will be outlined in this chapter.

What currently is told about the history of the universe and presented as secure knowledge is well known. So I can spare to go into it. Instead I want to ask you something:

Imagine, you measure the length of your dining table *today*. It is one meter. *Tomorrow* you measure again, and indeed with the same scale. This time the length is two meter.

What do you conclude? Either that the size of your dining table has doubled since yesterday, or that your scale has shrunk to half (– or that the size of both has changed, but we will ignore this variant).

Obviously, the two results alone do not permit any conclusion about which of these alternatives is correct. The decision is only possible if *further information* is available.

However exactly the same applies to the measured distance-dependent redshift:

Suppose we measure the wavelengths of two light rays that have been emitted from a certain element, say: Hydrogen, from two different cosmic distances – i.e. at two different points in time. The measurement is performed through a comparison with the wave-length by which the length unit is defined.

Evidently, there are two possibilities to interpret the distance-dependent redshift:

1. The universe expands.

2. The universe does *not* expand – instead our yardsticks shrink, which means: all wave-lengths, which may serve to define the unit of length, decrease with time. (Of course this applies also to the waves emitted by Hydrogen; however, from the instant of their emission, they remain unchanged.)

Also here applies that it cannot be deduced directly from the measurement whether 1 or 2 is true. For that, additional information is needed. The "rest of the circumstances" will motivate us to opt for one of the two variants.

This openness of the interpretation of the redshift is so obvious that the question arises whence the certainty comes with which has been assumed – indeed from the very beginning – that the universe expands, and why the alternative has never been seriously considered – all the more, as the assumption that the size of the universe is changeless and the redshift a consequence of the time-dependent decrease of the wavelengths that relate to material phenomena, would simply have made the absurd postulate of the so-called *big bang* superfluous.

It attracts attention that, in the historical development, there has never been any kind of doubt. The decision was clear from the outset, simply because the alternative did not lie within the horizon of the thinkable. This means that here deep unconscious prejudices are in effect – such ones, which exist prior to any act of thought and which represent therefore presuppositions of thinking.

It is also immediately clear *which* prejudice the view to the alternative option obscures: the notion of substantial, unchanging existence, which in physics survives in the form of the assumption of elementary particles and natural constants.

In order to avoid nonsensical concept formations and to get to a consistent local and objective interpretation, it has already proven necessary – in the explanation of the theory of relativity as well as in that of quantum theory – to replace the idea – no: the *prejudice* of substantial existence by the idea of change (which, in the Second Part, has developed into pure, i.e. *subject-less* change).

Now, as regards the question of the history of the universe, the same applies. Again it is necessary to reject the idea, which originates from the depths of a priori prejudices, that there is something given as non-contingent unchanging existent.

Exactly this idea is the source of the presently prevailing conviction that there was *an absolute scale,* with which even the size of the universe in total could be measured, and from whose existence would have to be concluded that the universe expands.

The two alternative hypotheses shall now be discussed briefly. First, we formulate them more precisely:

Hypothesis 1: The wave-length, by which the length unit is defined, is *absolute,* which means: time-invariant. The distance-dependent redshift of cosmic objects is a consequence of the increasing size of the universe.

Hypothesis 2: *All* wave-lengths – those emitted by cosmic objects as well as those by which a length unit can be defined – are *variable with time.* The distance-dependent redshift follows from the fact that all these wave-lengths decrease at the same rate over time. To put it simply: the size of the material structures decreases; the assumption of a variable size of the universe is superfluous.

The two hypotheses can be assessed in three ways:

1. Regarding the observations.

2. By the theories that play a role here.

3. On the basis of principal philosophical considerations.

Since by now you are somewhat familiar with my style of thinking, you know that I consider the third way the most important. Still, I begin with point one because it was of crucial importance in the historic development.

The observation which led to the assumption of an expanding universe was of course the distance-dependent redshift. But this observation does not only represent the beginning of this strange hypothesis but continues to be its fundament. However as such it is inappropriate, because – as was just demonstrated – it doesn't only support the assumption of an expanding universe but also the assumption of decreasing wave-lengths.

The second observation, which has led to the "conversion" of most physicists, was the cosmic background radiation, which had been predicted before and could be considered as echo of the "Big Bang".

How can the background radiation be explained within the frame of the alternative hypothesis?

Just in the same way as in the standard hypothesis. What is in general – apart from the question of variable or fixed size of the universe – the difference between the two hypotheses? As follows:

In the standard hypothesis, there are fixed ratios between certain quantities (natural constants), and, *additionally,* the quantities themselves are also fixed, that is: they have time-invariant, absolute values. In the alternative hypothesis, there are also fixed ratios between certain quantities (wave-lengths), but the additional postulate of fixed values of the quantities themselves is missing.

This is a strong argument in favor of the alternative hypothesis, because if there are two hypotheses that explain the same, the one with fewer presuppositions must be chosen.

Except that, in the alternative variant, everything which exists and which happens shrinks with time, physical processes are basically identical in both variants. From this follows that the observable phenomena do not permit to distinguish between the two variants.

An example: the so called cosmic time-dilatation. Suppose a far away event A causes another far away event B. In standard cosmology, the mediating process appears retarded, because event B occurs at a greater distance, such that the information about the event B reaches us later and, therefore, from our point of view the process seems to require a longer time.

In the alternative cosmology, the reason for the retardation is seen in the fact that the events are *actually* located at a greater distance from one another.

Does this mean that the alternative cosmology is just a spatial and temporal transformation of the standard cosmology? Not at all! Within the framework of the alternative hypothesis, the cosmos is *a closed metric structure,* and this is a fundamental change against standard cosmology. E.g. from this assumption follows directly a self-organization in the form of standing waves.

But we will get to that later. First, it should be noted that the alternative hypothesis based on the metric-dynamic physics is more than a mere transformation of cosmology, because it leads to a radical reinterpretation of the history of the cosmos, and because the "rest of the circumstances" – which, as elucidated previously, is indispensable for the decision which hypothesis to choose – is completely changed by it. The universe is then no more a building set, in which ever identical entities and their ever identical attributes represent reality, but a self-organizing structure, in which everything has *originated.*

Here, there is no room for the idea of *absolute existence,* which is the prerequisite for the assumption of an absolute scale. There are only waves which form patterns and whose lengths change with time. Only one thing remains constant: the ratio of the wave-lengths, because they relate to each other within the self-organization and are therefore bound to one another by natural laws.

However a stationary universe, as Einstein imagined originally, would be impossible for various reasons. One of these reasons is the fact that the equations of the general theory of relativity do not permit a time-invariant size of the universe. As is known, Einstein's attempt to make a steady universe possible by introducing the *cosmological constant,* does not work. The universe that corresponds to the adapted equations is not stable.

However the alternative hypothesis, according to which not the universe is expanding but all wave-lengths that relate to material phenomena change, does indeed not describe a stationary universe: the dynamics which is necessary to avoid contradictions is simply transferred from the size of the universe to the size of the material structures.

Now I change over to the argumentation area that I consider decisive for the question, which of the two hypotheses must be chosen: the philosophical area. Here, the situation is perfectly clear. To say it in advance:

A variable size of the universe can be excluded on metaphysical grounds.

The basis of the argumentation is that the concept *size* is only applicable in the realm of the *existing*. It is a *relation* between existing objects or between quantities connected with these objects.

Right at the beginning of the Second Part, we have already encountered an entity which the concept of size cannot be applied to. The *origin of everything* – that, which neither is nor is not and which cannot be thought as it is *in itself* – has no size. Everything that is relational originates from it, but it itself is *not* relational.

Let us briefly return to the initial equation (1)

$$\frac{d\sigma}{dr} = \pm \frac{1}{c^2}\frac{dv}{dt}$$

The fact that the *origin of everything* has no size manifests itself in three ways:

1. There are only *differential quotients*, i.e. *alterations* of quantities. The quantities themselves do not appear.

2. The equation is *linear*. Linearity means size (scale) invariance. If an equation of the form $x = y$ is transformed by

$$x \Rightarrow q\,x \qquad y \Rightarrow q\,y$$

then it remains identical.

3. A necessary condition for the simple form of equation (1) was to determine σ as *metric* density.

The metric density σ differs from the "normal" (one-dimensional) density ρ by the fact that there is no absolute value which the respective value of σ relates to; instead only *one* single differential time step is factored in. In other words: the normal density has a memory, the metric density has no memory.

However the absence of an absolute value means – at this level of reality and of its description – that there is no size. If σ were understood as normal density, then in equation (1) and (1a) the factor $1/\sigma$ would be necessary, and the size invariance mentioned at point 2 would disappear.

The difference between both kinds of density can be illustrated by the following thought experiment:

If one enlarges or reduces the size of a sphere, which is made of an elastic material and which, before the change, is in a (force-free) stable state, then a force will originate that acts against the change.

In the case of a *metric* sphere, however, in which only the metric density exists, enlargement and reduction are operations by which actually *nothing* is changed. The sphere is simply transformed into an identical sphere. *The idea of an absolute size loses its meaning and becomes empty.*

(But caution is required. From the scale invariance of (1) does *not* follow that a theory which is based on this equation is also scale invariant.)

Thus, at the beginning of the construction of physics from metaphysics stands the fact that there is no absolute size.

However the same applies to the universe *as a whole*. In the same way in which the *origin of everything* is not just a *thing with attributes,* also the universe as a whole is not a thing with attributes. *It is not relational.*

This fact reveals itself indeed immediately if the question is asked *against what* the universe actually expands. This question has already been posed many times, but hitherto nobody has drawn the correct consequence from the fact that an answer is impossible *on principle* – the consequence, that is, that it *cannot* expand, because here the concept "size" is not applicable.

The reason for this omission is that we *must* always think what we think as *substance and accident.*

At the beginning of our considerations, it was necessary to *objectify* the *origin of everything.* Though it does not divide into substance and accident, we had to assign to it *change* as attribute*,* in order to make it thinkable. And in the same way, as it was unavoidable to treat that which neither is nor is not *as if it* *were a thing,* it is also completely unavoidable to objectify the universe as a whole. And *one* way of objectification – indeed the most common one – is to assign a size to it.

However isn't this justified simply for the reason that we can put any chosen length unity into relation to the size of the universe?

Not at all! From the metric-dynamic point of view, the possibility to speak and think of the size of the universe is nothing but an artifact of the *a priori* necessity to objectify (treat as a thing) everything which is thought.

So what should be done if the size of the universe appears as function of time in an equation?

Plain and simple: since it is not permitted to apply the concept "size", which belongs to the world of things, to the universe as a whole, the size of the universe must remain untouched. And from that follows that the time-dependent alteration must always be interpreted as a change of the scale.

Proposition:

There is no absolute size, only size relations.

Not the universe expands, but all wave-lengths that relate to material phenomena decrease – and this is true for the wave-lengths that we receive from the cosmos as well as for those which we use for defining lengths scales.

This hypothesis is another important element of a universe that corresponds to the principles of reason. In this way, the assumption of the big bang becomes superfluous, by which the most important one of these principles is violated: the principle of the completeness of reality, which says that there is nothing but reality and that nothing – no model, no theory – can lead out of reality. Thus, if the big bang is understood as an event where *everything* originated – also, as is told, space and time – then, in light of this principle, that is simply nonsense.

In recent years, however, an increasing number of speculations has developed, that beyond the big bang might be another universe. Though these variants are to be preferred compared with the absurd idea of a beginning of everything, they still proof what had to be expected: just as in the context of the "reduction of the wave function", where now already for decades the strangest ideas have been roaming, also the Big Bang scenario turns more and more into a playground for the most absurd fantasies, such as the idea of "space-time bubbles" that arise constantly anew and evolve into universes. Here, science turns into science fiction and eventually into pure fantasy.

It is the fate of such erroneous assumptions to beget just more and more nonsense. So the respective scenarios are not at all *explanations,* i.e. they do not enable a reduction to something simpler, but on the contrary they represent *openings,* transitions to other, more complex scenarios with unknown elements, where always chance plays a central role. The apparent palatability of such fantastic amplifications merely obscures the fact that a real explanation is missing.

Dark Energy

The hypothesis that not the universe expands but the wave-lengths shorten permits not only to dispense with the absurd idea of a beginning of space and time, from it ensues also that the so-called *dark energy* vanishes into thin air. As follows:

In the standard cosmology before 1998, there were only two factors from which the velocity of the ostensibly expanding universe could depend: the *initial velocity* (after the end of the so-called inflation – a phase of exponentially accelerated drifting apart), and from then on only a gradual reduction of the velocity through the effect of gravity.

Thus, when at the end of the last millennium observations led to the conclusion that the speed of the expansion is increasing, this fact had no place in the existing model. Therefore it was necessary to introduce an *additional element* into the model – the so-called *dark energy*.

Such *ad hoc* introduced elements, which serve only for the purpose of eliminating a contradiction that occurs in an otherwise well-functioning model, are sometimes appropriate when problems of minor importance appear. However *dark energy* is by no means an unimportant element of the physical reality: it is supposed to account for 70% of the universe. So this is certainly the most enormous *ad hoc* conceptualization of all times!

That its invention, in accordance with the current presentation style in most branches of business, is celebrated by some physicists as the "dawn of a new physics", can hardly compensate for the fact that it is hitherto impossible either to integrate dark energy into the existing physics or to present just the slightest idea what a new kind of physics it should lead to.

How do the observational facts present themselves in the alternative cosmology?

The circumstances are straightforward:

Dark energy is the reason for the accelerated expansion of the universe. Thus, *if there is no expansion, then there is no dark energy.*

With this, everything of importance is already said. The unpleasant introduction of an unknown form of energy is superfluous.

Nevertheless, we will dwell a little on the subject, to discuss which observations are to be expected under the assumption that not the universe is expanding, but the wave-lengths are decreasing.

First it is to be noticed that a constant velocity of shortening of wave-lengths in the alternative model corresponds already to an increasing expansion velocity of the universe in the standard model.

A simple example for illustration:

Be t_0, t_1, t_2 three cosmic time points, $t_2 - t_1 = t_1 - t_0$.

At the time t_0 the wave-length that serves as length unit be equal to 1. If it decreases between t_0 and t_1 by 0.1 to 0.9, then in the standard cosmology this fact is interpreted as increase of the size of the universe by 1/9 of its size at t_0.

An equally large decrease of the wave-length from 0.9 to 0.8 between t_1 and t_2 corresponds to an increase in size of the universe by 1/8 of its size at t_1. Thus, the increase between t_1 and t_2 is $(1/8 * 10/9) = 1/7.2$ of the size at the time t_0.

Therefore, the increase of the size between t_1 and t_2 is greater than that between t_0 und t_1; the speed of the expansion has increased.

This would be the case if the shortening of all material wave-lengths would have a constant velocity. However this is not a plausible assumption. More probable seems a periodic change of the wave lengths. (With a period of at least some ten billion years.)

To realize this, it might be useful to draw an outline of the self-organizing universe.

What comes to mind immediately if one thinks of a closed self-organizing metric structure? Of course standing waves. Comparable with a vessel driven by a strike into a vibration state that manifests itself as sound, the cosmos organizes itself, based on the laws (1) and (1a), in the form of standing waves.

(I've been asked at this point: Who strikes the universe? – Well, nobody. The *origin of everything* does not divide into substance and accident, it is not *something which* changes. That, which neither is nor is not, *is* change. Without change, it disappears. Thus, it need not be struck – no, it *cannot* be struck, because it is only there as "struck", i.e. as everywhere and permanently changing.)

Cosmic observations on the one hand and our considerations on the other hand lead to the following assumption:

The cosmos organizes itself in the form of standing waves in two orders of magnitude:

1. In waves of the magnitude of some hundred million light-years. Their oscillation areas are the cosmic voids, around which galaxies are arranged in the form of clusters and filaments. In this model, they represent the node "surfaces", i.e. the areas of lesser extent that lie between the honeycomb-like voids.

2. In waves, the wave-length of which is equal to the (here time-dependent) Planck-length. They are the basis of the material structures. Upon them, as outlined in chapters 4 and 5, the material world is built up in the form of phase-waves, whose wavelengths are in constant ratios to one another and to the Planck length.

If the basic law (1) were based on the normal density, then the universe would be comparable to an ideal elastic medium, and it would have to be assumed that it approaches a stationary state, an attractor, which is of a similar kind as the sound of a struck vessel. As mentioned above, such a state is not permitted.

Can the fact, that (1) does not contain the normal density but the metric density, prevent the existence of an attractor of this type?

I believe yes, and I think the reason is that, in the case of a law which contains the normal density, any attractor relates to the absolute value of the length, where the density is equal to 1 and no accelerations occur. In the case of the metric density, such an absolute value does not exist. Therefore, in the case of normal density, the accelerations depend on the *absolute value* of the length, whereas in the case of metric density, they depend only on the *temporal change of the length*.

Basically, there are two variants: either the material wave-lengths are shortened *ad infinitum,* or they change periodically. I prefer the assumption of a periodic change. A change that occurs permanently into the same direction would appear strange to me. I consider it probable that, in the context of the self-organization of a closed metric structure, most of the quantities are subject to periodical changes.

Back to the question: is the decrease of the material wave-lengths constant or variable with time? Here, the decision is easy:

Within the framework of standard cosmology, the assumption of an (approximately) constant velocity of the expansion follows simply from the fact that the velocity of moving masses is always constant if no force is acting upon them. This justification disappears in the alternative cosmology, because here the masses do not at all move away from each other. There is then absolutely no reason for the assumption, the change of the wavelengths would occur in such a way that it could be interpreted as constant expansion velocity.

Also the assumption of a constant decrease of wavelengths is improbable. The wavelengths would then eventually become zero – however not asymptotically but instantly. This is not plausible, and therefore it must be assumed that the decrease of the wavelengths varies over time.

However these considerations have no relevance for the question of *dark energy.* The only fact to note here is the following:

Observations, which in the standard cosmology must be understood as proof for the accelerated expansion of the universe and enforce *ad hoc* assumptions, are, in the metric-dynamic cosmology, compatible with the simplest model assumptions. In order to explain them, no additional assumptions are required – and this applies to *any* variant, regardless of whether it is assumed that the alteration of the wave-lengths has only one direction or that it changes periodically.

Actually, in the alternative cosmology the circumstances are exactly the reverse of the ones in the standard cosmology: In the standard cosmology, in order to explain the *change* of the velocity of the expansion, an *ad hoc* assumption is required, whereas, in the alternative cosmology, the assumption that the change of the wavelengths occurred exactly in such a way that – seen as expansion of the universe – it would correspond to a *constant* expansion velocity, would require an *ad hoc* explanation.

An alternative Story of the Cosmos

Let us in short complete our history of the self-organizing universe.

There is no beginning. The universe is a closed metric structure, which organizes itself in the form of standing waves in two orders of magnitude.

The first kind of waves is cosmic waves: longitudinal metric waves with a length of some hundred million light years. They form *cosmic voids,* which represent the oscillating areas of these cosmic waves. Where the voids adjoin one another, there are areas of lesser extent that represent the node areas of the cosmic waves. The pattern formation, which takes place here, corresponds to the formation of structures that is assumed in the standard cosmology. First, the simplest forms of matter develop. However – as elucidated in the previous chapters – their interpretation changes: the particles and fields that emerge are seen as *phase wave structures.*

Precondition of this kind of pattern formation is the existence of a second kind of standing waves, the lengths of which decreases in the course of the cosmic evolution. (Currently, they are by 57 orders of magnitude shorter than the standing waves of the first kind.) They are waves with Planck-length. They exist in the longitudinal flows, whose simplest forms were identified in chapter 2 with the phenomena called *gravitation* in standard physics.

The dynamics of the phase wave structures – in standard physics called "the four interactions" – leads to further pattern formation over many orders of magnitude, from atoms up to super clusters of galaxies. Since all structures within the node areas of the cosmic waves are based on the Planck-waves and remain connected with them, the size of these structures changes always at the same rate as the length of the Planck-waves.

Why do the wave-lengths change? Since, if the universe were an ideal elastic medium, a stationary state in the form of a basic frequency and harmonics would take place, the reason for the change must be sought in the difference between the universe of the alternative cosmology and a universe that organizes itself like an ideal elastic medium.

This difference consists, as mentioned above, in the fact that an ideally-elastic medium would have a normal density, while in the alternative universe everything depends on the metric density, in other words: exclusively on the temporal course of the metric length- and angle-densities. The absolute point of reference, which determines the behavior of a medium, is missing here.

Let us then assume the material wave-lengths decrease over time. What is the temporal development of this decrease? Presumably periodical, and the duration of one period should be substantially greater than the time which, in the standard cosmology, is currently considered the age of the universe since the big bang.

Perhaps after a certain number of periods dissolution of the material structure takes place, and then a new phase of self-organization begins.

However perhaps there is only one single period. The material structures originate, develop, shrink at the same time until a minimum is reached, then the material wave-lengths increase again – up to the point where all patterns dissolve again.

Then the game can begin anew.[1]

Dark Matter

The outer areas of galaxies rotate faster than they are supposed to as regards the observed masses.

In the standard model, this means that there must be additional, not visible mass. It is called *dark matter.*

(The other possibility is to change the law of gravitation on large scales. Of course Newton's law – the $1/r^2$ dependence of gravitation – can easily be changed. However in fact the change is about *Einstein's* gravitation law, and this law provides much more resistance against the necessary correction. And this applies even more to the law of gravitation presented here: according to its nature it cannot be changed at all.)

Also here, the metric dynamic model of the cosmos offers the possibility to dispense with ad hoc assumptions.

[1] Since the directionality of time is a necessity only through self-organization and is thus bound to structure formation, the time has no direction in a phase of structural disintegration or absence of structures. This means that, if a cosmos disintegrates and another cosmos evolves, it is not possible to see the one as the "previous" and the other one as the "later" cosmos. So it cannot be claimed that the time can be extended without a limit "into the past" or "into the future".

Let us first ask: What is actually the difference between Einstein's view of gravitation and the metric-dynamic view?

Einstein describes gravitation as distortion of the space-time-continuum, whereas in the metric-dynamic model gravitation is seen as metric densification of space, i.e. as alteration of the length unit, from which in turn follows a *metric flow.* In this way, space turns into a dynamic entity, *it becomes an accelerated flow itself.* (See *The Concept of Reality* p. 216ff)

In this view, at first time remains unaltered, and only at the transition to local observer systems, the valid local time can be derived from the velocity of the metric flow. As was demonstrated in the Second Part, in some simple cases (perihelion precession, light deviation, circular orbit of light), the results agree with those of General Relativity. However, if great masses are moving, the results of the two theories diverge, for the following reason:

The flow lines are accelerated by the masses. So they are *directed to* the masses, they *follow* them. This means: if – as in the case of galaxies – a great amount of mass rotates around a center, then *also space itself rotates.* The motion of the stars that results from their mutual gravitation plus the gravitation of the black hole in the center, must therefore be seen in relation to *that* space that is already rotating – contrary to Einstein's or Newton's theory, where of course it has to be understood as relative to *resting* space.

This means: *The rotation of space, that has to be expected in our view of gravitation, must be added to the rotation that follows from the usual view.*

Actually, Einstein's version of gravity and the metric-dynamic version agree exactly only in the case of gravity of one single object. However, in any real scenario, there is more than one object, and since the flow lines follow the movements of the objects which cause the flow, the motion of space must always be factored in. In many cases, however, as e.g. in solar systems, the adjustment would be minimal, because the main part of the metric densification and therefore also of the acceleration of the metric flow is caused by a central object. In the case of galaxies, however, this is not true. Here, the rotation of space contributes significantly to the observed rotation speed.

Admittedly, this explanation is just an outline. But at least it shows very clearly the mechanism that lies behind the observed increased rotation speed. And, moreover, it demonstrates that the idea of a cosmos that organizes itself in the form of metric flows and waves offers much more dynamical possibilities than the standard version – possibilities which provide more attractive explanations for the observed gravitational phenomena than the assumption of exotic kinds of matter.

In the standard model of cosmology, dark matter has a further important task: without it, no agglomeration of material objects could occur, which means: there would be no stars, galaxies, galaxy-clusters etc. Only dark matter allows the generation of these material structures. For this purpose, however, it is necessary to adjust *ad hoc* the amount of dark matter as well as the time of its decoupling from radiation in the early universe.

In the metric dynamic model, the initial structure-building is self-evident: space organizes itself into a shape of standing waves, which in turn form the large-scale background for the generation of material structures.

Comparison

Finally, we compare the two cosmological narratives:

What can be said with respect to the observational data?

As mentioned already at the beginning, the observations do not permit a decision which variant must be chosen. Since the structure formation, as far as material structures are involved, in the alternative cosmology is analogous to that in the standard cosmology, and since the hitherto applied physics is not suspended but only reinterpreted, the observational data confirm both models – except for two facts: some red-shifts measured since 1998 and the dynamics of galaxies.

In the standard cosmology, these facts force two *ad hoc* assumptions: the existence of *dark energy* and of *dark matter.*

To say it very clearly: both facts *contradict* the hitherto prevailing concept of the cosmos and of its history. Therefore it seems entirely appropriate to interpret this as a refutation of the previous assumptions – as far as a refutation is possible at all. As is well known, any existing model can be immunized against emerging contradictions by *ad hoc* assumptions.

(Since its invention, however, dark matter proves to be very useful in computer simulations of the structure formation in the cosmos – to such an extent that now nothing works without it. But this is not, as some physicists believe, an argument for the existence of dark matter. It goes without saying that an entity, whose distribution and properties can be determined completely free and unhindered by theoretical requirements, facilitates modeling.)

In the alternative cosmology, however, no additional assumptions are needed. The assumption of *dark energy* is superfluous, because here a non-linear redshift-law corresponds to the simplest model assumptions. (If it would actually be approximately linear in the long term, then exactly this fact would require an *ad hoc* explanation in the alternative model.)

In the alternative model, also the observed galaxy dynamics, which, in the usual interpretation, can only be explained by the assumption of additional non-luminous mass, does not require exotic *ad hoc* additions.

As regards the question of structure formation in general, the alternative model differs from the standard model in that it contains a top-down structure formation, which does not exist in the standard version: the large scale patterning in the form of standing waves. The structure formation in all orders of magnitude, which in the standard model still causes considerable difficulties, is thereby facilitated.

Summary

No beginning, no expansion, no absolute quantities, *self-organization* through metric flows and waves.

These are in short the main characteristics, by which the alternative model of the cosmos differs from the standard model.

No beginning: this corresponds to the principle of *completeness of reality.* The idea of a beginning of everything leads beyond reality and must therefore be rejected.

No expansion: this is a metaphysical certainty. The universe as a whole is not a *thing*. It is *not relational.* It would be nonsensical to assign a variable size to it.

No absolute quantities: this follows from the basic principles of this work, which have been introduced in the First and Second Part. In short: there are no absolute entities. Everything which exists is originated. Everything changes over time. In the context of self-organization, only the ratios of wave-lengths remain constant.

Self-organization by metric flows and waves: this follows from the build-up of physics from metaphysics.

These statements represent what, at the beginning of this chapter, was called *additional information,* which is necessary for the decision, which cosmological model must be chosen.

The hitherto acquired observational facts confirm both models in the same way – with two exceptions: gravity that cannot be traced back to the luminous matter known in current physics, and "accelerated expansion".

In the standard model, these two phenomena enforce the introduction of exotic entities.

In the alternative model, there is no expansion, such that the explanation of its acceleration is obsolete, and the just mentioned gravitational phenomena (e.g. the high rotation speed of the outer areas of galaxies) can be understood as part of the self-organization of the universe by metric flows and waves.

Note:

Seen historically, the question of whether the universe is expanding or the material wavelengths become smaller is of a similar kind as the question of whether the sun revolves around the earth or the earth around the sun. In both cases, the observable consequences of the competing hypotheses are (initially) identical, and the first-mentioned hypothesis is the one that fits perfectly into the just prevailing world view, whereas the alternative seems impossible in an almost ridiculous way.

Yet this belief is – in both cases – no more than a prejudice that occurs as a result of a series of other prejudices and vanishes together with those.